AP 101 – Supply - Demand	
AP Summary:	"Action Plan 101" applies to conditions where the overall system demand approaches the reliable level of output from the water treatment plant. Such conditions will place stress upon normal operating procedures of the utility. These conditions can be caused by events associated with raw water supply, water treatment plant output and potable water distribution demand patterns. The countermeasures that are available to the City include: 1) response and remediation protocol as set forth in AP100 series and other action plans 2) extended operations of the City's water treatment plant, 3) the availability to proportionally use multiple raw water sources, 4) an interconnection to Rockingham County's potable water distribution system and 5) multiple levels of conservation measures that can be placed into effect by action of City Council.
Threat Warning Received:	Monitoring the supply of raw water and treatment shall be the responsibility of the Superintendent of Water Treatment and the Water Treatment Plant Operations staff. Natural conditions such as drought will show the effects over a period of time and should initiate more careful observation with extended favorable conditions. In contrast, other events that result in an immediate loss of supply or treatment, or result in extreme high demands, should be readily recognized by the operation staff through SCADA and other monitoring tools of operation.
Threat Warning Possible:	General alerts for droughts shall require the department to evaluate its North River Source, Switzer Dam Level, Rawley Springs delivery capacity, weekly WTP output, weekly demand volume and reservoir storage levels. The water treatment plant operations staff, under the direction of the Superintendent of Water Treatment, shall be incident responders during the possible stage of the threat evaluations. Alerts indicating immediate impact and the need for Response and Remediation Protocol (API00 series) shall initiate the operations staff to engage other responders who are capable to perform advanced stage investigations and remediations. The department shall investigate each specific complaint pursuant to standard operating procedures within the department.
Threat Warning Credible:	For extended supply or demand warnings, and in the event that the threat warning has been determined to be possible, the Superintendent of Water Treatment shall monitor and document the information as required in the attached "Supply-Demand Monitoring Summary" form. This includes ▪ Daily monitoring of raw water supply/WTP water output and distribution system demands and storage status. ▪ Weekly monitoring of the Switzer Dam water storage level and North River stream flow.
Threat Warning Confirmed:	For extended supply or demand patterns, and if any trigger level of the supply-demand matrix (Supplement C) has been met, the Public Utilities "Emergency Management Team (consisting of the Director, Assistant Director, Superintendent of Field Utilities, Superintendent of Water Treatment, Pump Assets/Operations Manager and Engineer of Water Utilities) shall meet to consider specific response activities. Exception is noted in that the Superintendent of Water Treatment may extend operations of the treatment plant at his/her sole discretion.
Specific Activities	See attached "Water Supply and Demand Planning Matrix" with reference to seven action sequence levels that define specific available resources with trigger levels to implement the resources.
Recovery and Return to Safety	Maintain specific activities until return to acceptable ranges in supply-demand matrix. Continue conservation until water storage (source & distribution) is replenished or continue Public Notifications in the media to inform citizens of status.

AP 101 – Supply - Demand	
Report of Findings	
***[AP ID]* - Revision Dates**	October 23, 2007

- Purpose: The purpose of the supply and demand planning matrix is to establish guidelines for implementing specified action items. Three criteria are listed; any one of these criteria could trigger the implementation schedule. The criteria are 1) The available water supply in perspective to the demand, 2) North River Environmental Initiative, and 3) the available volume of stored water in Switzer Dam to support full supply capacity at Rawley Springs.

WATER SUPPLY AND DEMAND PLANNING MATRIX

ACTION SEQUENCE	ACTION PLAN	UTILIZED CAPACITY	NORTH RIVER	SWITZER DAM RESERVE
1	Expand WTP Operation Schedule	N/A	N/A	N/A
2	Utilize Rockingham Co Greendale Connection	≥ 95%	43 cfs	45 days
3	Voluntary Conservation	≥ 95%	43 cfs	45 days
4	Operate North River Pump #3	≥ 95%	-	20 days
5	Mandatory Conservation	≥ 95%	38 cfs	20 days
6	Revitalize Silver Lake Pump Station	≥ 99%	-	14 days
7	Emergency Conservation	≥ 99%	34 cfs	14 days

- Utilized Supply Capacity
  - % Utilized Capacity =(Total Weekly Demand / Total Available Weekly Supply) x 100
  - Weekly demand is taken per VDH approved format using meters at the WTP ; changes in distribution storage should also be considered.

o Weekly available supply is calculated as follows; normal or baseline operation status is shown:

	Baseline	
Available 24/7 flow from Rawley (MGW)	28.0	Note 1
Available 24/7 flow from North River (MGW)	39.9	Note 2
Available 24/7 flow from Rockingham Co (MGW)	0.0	Note 3
Available 24/7 flow from North River 3 (MGW)	0.0	Note 4
Available 24/7 flow from Silver Lake (MGW)	0.0	Note 5
Available 24/7 flow from Shenandoah (MGW)	0.0	Note 6
Total Available Flow (MGW)	67.9	
Less 7 day Backwash Volume (MGW)	(1.6)	Note 7
Less 7 day Backwash Effect to Supply (MGW)	(2.9)	Note 8
Supply Capacity (MGW)	63.4	

Notes :

1. During drought, releases from Switzer Dam may be required to sustain full intake capacity (assume 5.5 MGD release will provide 4.0 MGD at Rawley intake).
2. North River, with two pumps operating, is considered a 100% reliable supply, however, we must recognize sensitivity to the environment.
3. Requires installation of meter at Greendale – 1.0 MGD or 7.0 MGW maximum potential.
4. Using a third pump at North River will implement significantly higher electrical charges for a substantial period; a mobile generator is available for consideration. Additional concern is recognized because pumps may cavitate at low streamflow with 3 operating at North River.
5. Silver Lake pumps are currently nonoperational and should not be recognized at this time.
6. The Shenandoah project is not available; currently in planning phase.
7. Four (4) backwashes per week consuming 400,000 gallons per backwash.
8. Backwash (4 per week) requires shutdown of one pump at Bridgewater for three (3) hours; loss of 725,000 gallons supply per backwash or 2,900,000 gallons per week.

- North River Environmental Status: The mean annual flow rate (MAF) at the Burketown Gauge Station on North River is 371 cfs. Real time measurements can be obtained at http://waterdata.usgs.gov/va/nwis (location 01622000). Protection of the North River watershed was evaluated in 1994 ; a draft agreement was formulated in this interest. Within the agreement were specified Burktown gauging station streamflows that could be used to trigger conservation activities. The same triggers are used in the matrix (assuming a HRRSA discharge of 8.0 mgd).

- Switzer Dam Reserve: Raw water from Rawley Springs provides 40% - 50% of the total city water supply. During drought, a release of 5.5 mgd can flow over land from Switzer Dam to Rawley Springs, providing a sustained 4.0 mgd maximum intake to the city.
  The volume of stored water should be obtained by field measurements and the attached graph. Recognizing the 400,000,000 is not available but must be retained to sustain aquatic life, the duration of available supply is

$$\text{Days} = \frac{\text{Volume in storage (gals)} - 400{,}000{,}000 \text{ (gals)}}{5{,}500{,}000 \text{ gallons per day}}$$